WHAT IS CLAIMED IS:

1. A data transmission system for transmitting user data to and receiving data from a communication channel, comprising:

a parity check matrix comprising:

M tiers, wherein $M \geq 2$,

$Dmin = 2 * M$ for $M=1..3$ or $2*M \geq Dmin \geq 6$ for $M > 3$, wherein Dmin is the minimum Hamming distance,

tc=M, wherein tc is the column weight, and

cycle-4=0;

a linear block encoder to encode the user data in response to said parity check matrix;

a transmitter to transmit an output of said linear block encoder to the communication channel;

a soft channel decoder to decode data; and

a soft linear block code decoder to decode data decoded by said soft channel decoder in response to said parity check matrix.

2. A data transmission system according to Claim 1, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

3. A data transmission system according to Claim 2, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

4. A data transmission system according to Claim 2, wherein said M tiers are arranged in increasing rank order.

5. A data transmission system according to Claim 4, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

6. A data transmission system according to Claim 2, wherein said matrix comprises R rows, wherein $R = \sum_{i=1}^{M} P_i$.

7. A data transmission system according to Claim 6, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

8. A data transmission system according to Claim 2, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

9. A data transmission system according to Claim 2, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

10. A data transmission system according to Claim 4, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \leq r \leq \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{Bmatrix} 1, if\, c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{Bmatrix}$$

$$0 \leq c \leq C$$

$$C \leq P_1 * P_2$$

11. A data transmission system according to Claim 4, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

12. A data transmission system according to Claim 11, wherein a code rate = (P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2).

13. A data transmission system according to Claim 1, wherein said linear block code encoder comprises a low-density parity-check encoder and wherein said soft linear block code decoder comprises a low-density parity-check decoder.

14. A data transmission system according to Claim 1, wherein said soft channel decoder comprises a soft Viterbi algorithm decoder.

15. A decoder for decoding data from a communication channel, comprising:

a parity check matrix comprising:

M tiers, wherein $M \geq 2$,

Dmin = 2 * M for M=1..3 or $2^*M \geq \text{Dmin} \geq 6$ for M > 3, wherein Dmin is the minimum Hamming distance,

tc=M, wherein tc is the column weight, and

cycle-4=0;

a soft channel decoder to decode data; and

a soft linear block code decoder to decode data decoded by said soft channel decoder in accordance with said parity check matrix.

16. A decoder according to Claim 15, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

17. A decoder according to Claim 16, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

18. A decoder according to Claim 16, wherein said M tiers are arranged in increasing rank order.

19. A decoder according to Claim 18, wherein said matrix comprises C columns, wherein C $\leq P_1 * P_2$.

20. A decoder according to Claim 16, wherein said matrix comprises R rows, wherein R= $\sum_{i=1}^{M} P_i$.

21. A decoder according to Claim 20, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

22. A decoder according to Claim 16, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

23. A decoder according to Claim 16, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

24. A decoder according to Claim 18, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \le r \le \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{Bmatrix} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{Bmatrix}$$

$$0 \le c \le C$$

$$C \le P_1 * P_2$$

25. A decoder according to Claim 18, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

26. A decoder according to Claim 25, wherein a code rate = $(P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2)$.

27. A decoder according to Claim 15, wherein said linear block code encoder comprises a low-density parity-check encoder and wherein said soft linear block code decoder comprises a low-density parity-check decoder.

26. A decoder according to Claim 15, wherein said soft channel decoder comprises a soft Viterbi algorithm decoder.

27. An encoder for encoding data from a communication channel, comprising:

a parity check matrix comprising:

M tiers, wherein M≥2,

Dmin = 2 * M for M=1..3 or 2*M ≥ Dmin ≥ 6 for M > 3, wherein Dmin is the minimum Hamming distance,

tc=M, wherein tc is the column weight, and

cycle-4=0;

a linear block encoder to encode the user data in response said parity check matrix; and

a transmitter to transmit an output of said linear block encoder to the communication channel.

28. An encoder according to Claim 27, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

29. An encoder according to Claim 28, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

30. An encoder according to Claim 28, wherein said M tiers are arranged in increasing rank order.

31. An encoder according to Claim 30, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

32. An encoder according to Claim 28, wherein said matrix comprises R rows, wherein $R=\sum_{i=1}^{M} P_i$.

33. An encoder according to Claim 32, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

34. An encoder according to Claim 28, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

35. An encoder according to Claim 28, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

36. An encoder according to Claim 30, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \le r \le \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{Bmatrix} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{Bmatrix}$$

$$0 \le c \le C$$

$$C \le P_1 * P_2$$

37. An encoder according to Claim 30, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

38. An encoder according to Claim 37, wherein a code rate = $(P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2)$.

39. An encoder according to Claim 27, wherein said linear block code encoder comprises a low-density parity-check encoder and wherein said soft linear block code encoder comprises a low-density parity-check encoder.

40. An encoder according to Claim 27, wherein said soft channel encoder comprises a soft Viterbi algorithm encoder.

41. A parity check matrix for one of a low-density parity-check encoder and a low-density parity-check decoder, comprising:

M tiers, wherein $M \geq 2$,

$Dmin = 2 * M$ for $M=1..3$ or $2*M \geq Dmin \geq 6$ for $M > 3$, wherein Dmin is the minimum Hamming distance,

tc=M, wherein tc is the column weight, and

cycle-4=0.

42. A parity check matrix according to Claim 41, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

43. A parity check matrix according to Claim 42, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

44. A parity check matrix according to Claim 42, wherein said M tiers are arranged in increasing rank order.

45. A parity check matrix according to Claim 44, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

46. A parity check matrix according to Claim 42, wherein said matrix comprises R rows, wherein $R=\sum_{i=1}^{M} P_i$.

47. A parity check matrix according to Claim 46, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

48. A parity check matrix according to Claim 42, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

49. A parity check matrix according to Claim 42, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

50. A parity check matrix according to Claim 44, wherein for each

$$[A_{r,c}]$$

element

$$For \sum_{j=1}^{n-1} P_j + 1 \leq r \leq \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{cases} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{cases}$$

$$0 \leq c \leq C$$

$$C \leq P_1 * P_2$$

51. A parity check matrix according to Claim 44, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

52. A parity check matrix according to Claim 51, wherein a code rate = $(P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2)$.

53. A data transmission system for transmitting user data to and receiving data from a communication channel, comprising:

a parity check matrix comprising:

M tiers, wherein $M \geq 2$,

$Dmin = 2 * M$ for $M=1..3$ or $2*M \geq Dmin \geq 6$ for $M > 3$, wherein Dmin is the minimum Hamming distance,

$tc=M$, wherein tc is the column weight, and

cycle-4=0;

linear block encoding means for encoding the user data in response to said parity check matrix;

transmitting means for transmitting an output of said linear block encoding means to the communication channel;

soft channel decoding means for decoding data; and

soft linear block code decoding means for decoding data decoded by said soft channel decoding means in response to said parity check matrix.

54. A data transmission system according to Claim 53, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

55. A data transmission system according to Claim 54, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

56. A data transmission system according to Claim 54, wherein said M tiers are arranged in increasing rank order.

57. A data transmission system according to Claim 56, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

58. A data transmission system according to Claim 54, wherein said matrix comprises R rows, wherein R= $\sum_{i=1}^{M} P_i$.

59. A data transmission system according to Claim 58, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

60. A data transmission system according to Claim 54, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

61. A data transmission system according to Claim 54, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

62. A data transmission system according to Claim 56, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \le r \le \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{Bmatrix} 1, ifc \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{Bmatrix}$$

$$0 \le c \le C$$

$$C \le P_1 * P_2$$

63. A data transmission system according to Claim 56, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

64. A data transmission system according to Claim 63, wherein a code rate = (P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2).

65. A data transmission system according to Claim 53, wherein said linear block code encoding means comprises a low-density parity-check encoding means and wherein said soft linear block code decoding means comprises a low-density parity-check decoding means.

66. A data transmission system according to Claim 53, wherein said soft channel decoding means comprises a soft Viterbi algorithm decoding means.

67. A decoder for decoding data from a communication channel, comprising:

a parity check matrix comprising:

M tiers, wherein $M \geq 2$,

Dmin = 2 * M for M=1..3 or 2*M ≥ Dmin ≥ 6 for M > 3, wherein Dmin is the minimum Hamming distance,

tc=M, wherein tc is the column weight, and

cycle-4=0;

soft channel decoding means for decoding data; and

soft linear block code decoding means for decoding data decoded by said soft channel decoding means in accordance with said parity check matrix.

68. A decoder according to Claim 67, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

69. A decoder according to Claim 68, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

70. A decoder according to Claim 68, wherein said M tiers are arranged in increasing rank order.

71. A decoder according to Claim 70, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

72. A decoder according to Claim 68, wherein said matrix comprises R rows, wherein $R=\sum_{i=1}^{M} P_i$.

73. A decoder according to Claim 72, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

74. A decoder according to Claim 68, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

75. A decoder according to Claim 68, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

76. A decoder according to Claim 70, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \le r \le \sum_{j=1}^{n} P_J,$$

$$A_{r,c} = \begin{Bmatrix} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_J \\ 0, otherwise \end{Bmatrix}$$

$$0 \le c \le C$$

$$C \le P_1 * P_2$$

77. A decoder according to Claim 70, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

78. A decoder according to Claim 77, wherein a code rate = $(P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2)$.

79. A decoder according to Claim 67, wherein said linear block code encoding means comprises a low-density parity-check encoding means and wherein said soft linear block code decoding means comprises a low-density parity-check decoding means.

80. A decoder according to Claim 67, wherein said soft channel decoding means comprises a soft Viterbi algorithm decoding means.

81. An encoder for encoding data from a communication channel, comprising:

a parity check matrix comprising:

M tiers, wherein M≥2,

Dmin = 2 * M for M=1..3 or 2*M ≥ Dmin ≥ 6 for M > 3, wherein Dmin is the minimum Hamming distance,

tc=M, wherein tc is the column weight, and

cycle-4=0;

linear block encoding means for encoding the user data in response said parity check matrix; and

transmitting means for transmitting an output of said linear block encoding means to the communication channel.

82. An encoder according to Claim 81, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

83. An encoder according to Claim 82, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

84. An encoder according to Claim 82, wherein said M tiers are arranged in increasing rank order.

85. An encoder according to Claim 84, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

86. An encoder according to Claim 82, wherein said matrix comprises R rows, wherein $R=\sum_{i=1}^{M} P_i$.

87. An encoder according to Claim 86, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

88. An encoder according to Claim 82, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

89. An encoder according to Claim 82, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

90. An encoder according to Claim 84, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \le r \le \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{cases} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{cases}$$

$$0 \le c \le C$$

$$C \le P_1 * P_2$$

91. An encoder according to Claim 84, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

92. An encoder according to Claim 91, wherein a code rate = $(P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2)$.

93. An encoder according to Claim 81, wherein said linear block code encoding means comprises a low-density parity-check encoding means and wherein said soft linear block code encoding means comprises a low-density parity-check encoding means.

94. An encoder according to Claim 81, wherein said soft channel encoding means comprises a soft Viterbi algorithm encoding means.

95. A method for transmitting data to and receiving data from a communication channel, comprising the steps of:

(a) generating a parity check matrix comprising:

M tiers, wherein $M \geq 2$,

Dmin = 2 * M for M=1..3 or 2*M ≥ Dmin ≥ 6 for M > 3, wherein Dmin is the minimum Hamming distance,

tc=M, wherein tc is the column weight, and

cycle-4=0;

(b) linear block encoding the data in accordance with the parity check matrix generated in step (a);

(c) transmitting the data encoded in step (b) to the communication channel;

(d) receiving the data from to the communication channel;

(e) soft channel decoding the data read in step (d) in accordance with data decoded in step (g);

(f) generating an address in accordance with the data soft linear block code decoding the data decoded in step (e); and

(g) soft linear block code decoding data decoded by in step (e) in accordance with the address generated in step(f).

96. A method according to Claim 95, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

97. A method according to Claim 96, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

98. A method according to Claim 96, wherein said M tiers are arranged in increasing rank order.

99. A method according to Claim 98, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

100. A method according to Claim 96, wherein said matrix comprises R rows, wherein $R=\sum_{i=1}^{M} P_i$.

101. A method according to Claim 100, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

102. A method according to Claim 96, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

103. A method according to Claim 96, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

104. A method according to Claim 98, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \le r \le \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{Bmatrix} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{Bmatrix}$$

$$0 \le c \le C$$

$$C \le P_1 * P_2$$

105. A method according to Claim 98, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

106. A method according to Claim 105, wherein a code rate = $(P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2)$.

107. A method for decoding data received from a communication channel, comprising the steps of:

(a) soft channel decoding the data received in accordance with data decoded in step (c);

(b) generating a parity check matrix comprising:

M tiers, wherein M≥2,

Dmin = 2 * M for M=1..3 or 2*M ≥ Dmin ≥ 6 for M > 3, wherein Dmin is the minimum Hamming distance,

tc=M, wherein tc is the column weight, and

cycle-4=0; and

(c) soft linear block code decoding data decoded by in step (a) in accordance with the matrix generated in step(b).

108. A method according to Claim 107, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

109. A method according to Claim 108, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

110. A method according to Claim 108, wherein said M tiers are arranged in increasing rank order.

111. A method according to Claim 110, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

112. A method according to Claim 108, wherein said matrix comprises R rows, wherein $R=\sum_{i=1}^{M} P_i$.

113. A method according to Claim 108, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

114. A method according to Claim 108, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

115. A method according to Claim 108, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

116. A method according to Claim 110, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \le r \le \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{Bmatrix} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{Bmatrix}$$

$$0 \le c \le C$$

$$C \le P_1 * P_2$$

117. A method according to Claim 110, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

118. A method according to Claim 117, wherein a code rate = (P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2).

119. A method for encoding data transmitted to a communication channel, comprising the steps of:

(a) generating a parity check matrix comprising:

M tiers, wherein M≥2,

Dmin = 2 * M for M=1..3 or 2*M ≥ Dmin ≥ 6 for M > 3, wherein Dmin is the minimum Hamming distance,

tc=M, wherein tc is the column weight, and

cycle-4=0;;

(b) linear block encoding the data in accordance with the matrix generated in step (a); and

(c) transmitting the data encoded in step (b) to the communication channel.

120. A method according to Claim 119, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

121. A method according to Claim 120, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

122. A method according to Claim 120, wherein said M tiers are arranged in increasing rank order.

123. A method according to Claim 122, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

124. A method according to Claim 120, wherein said matrix comprises R rows, wherein $R = \sum_{i=1}^{M} P_i$.

125. A method according to Claim 124, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

126. A method according to Claim 120, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

127. A method according to Claim 120, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

128. A method according to Claim 122, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \le r \le \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{Bmatrix} 1, ifc \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{Bmatrix}$$

$$0 \le c \le C$$

$$C \le P_1 * P_2$$

129. A method according to Claim 122, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

130. A method according to Claim 129, wherein a code rate = (P_1 $P_2+P_1-P_2-P_3+2$)/(P_1 P_2).

131. A computer program embodied in a medium for transmitting data to and receiving data from a communication channel, comprising the steps of:

(a) generating a parity check matrix comprising:

M tiers, wherein M≥2,

Dmin = 2 * M for M=1..3 or 2*M ≥ Dmin ≥ 6 for M > 3, wherein Dmin is the minimum Hamming distance,

tc=M, wherein tc is the column weight, and

cycle-4=0;

(b) linear block encoding the data in accordance with the parity check matrix generated in step (a);

(c) transmitting the data encoded in step (b) to the communication channel;

(d) receiving the data from to the communication channel;

(e) soft channel decoding the data read in step (d) in accordance with data decoded in step (g);

(f) generating an address in accordance with the data soft linear block code decoding the data decoded in step (e); and

(h) soft linear block code decoding data decoded by in step (e) in accordance with the address generated in step(f).

132. A computer program according to Claim 131, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

133. A computer program according to Claim 132, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

134. A computer program according to Claim 132, wherein said M tiers are arranged in increasing rank order.

135. A computer program according to Claim 134, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

136. A computer program according to Claim 132, wherein said matrix comprises R rows, wherein $R = \sum_{i=1}^{M} P_i$.

137. A computer program according to Claim 136, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

138. A computer program according to Claim 132, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

139. A computer program according to Claim 132, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

140. A computer program according to Claim 134, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \leq r \leq \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{cases} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{cases}$$

$$0 \leq c \leq C$$

$$C \leq P_1 * P_2$$

141. A computer program according to Claim 134, wherein M=3, the number of rows $= P_1+P_2+P_3$, the number of columns= P1 * P2, dmin=6, and tc=3.

142. A computer program according to Claim 131, wherein a code rate $= (P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2)$.

143. A computer program embodied in a medium for decoding data received from a communication channel, comprising the steps of:

(a) soft channel decoding the data received in accordance with data decoded in step (c);

(b) generating a parity check matrix comprising:

M tiers, wherein M≥2,

Dmin = 2 * M for M=1..3 or 2*M $\geq$ Dmin $\geq$ 6 for M > 3, wherein Dmin is the minimum Hamming distance,

tc=M, wherein tc is the column weight, and

cycle-4=0; and

(c) soft linear block code decoding data decoded by in step (a) in accordance with the matrix generated in step(b).

144. A computer program according to Claim 143, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

145. A computer program according to Claim 144, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

146. A computer program according to Claim 144, wherein said M tiers are arranged in increasing rank order.

147. A computer program according to Claim 146, wherein said matrix comprises C columns, wherein C $\leq P_1 * P_2$.

148. A computer program according to Claim 144, wherein said matrix comprises R rows, wherein R=$\sum_{i=1}^{M} P_i$.

149. A computer program according to Claim 148, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

150. A computer program according to Claim 144, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

151. A computer program according to Claim 144, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

152. A computer program according to Claim 146, wherein for each element

$$[A_{r,c}]$$

$$\begin{aligned}
&For \sum_{j=1}^{n-1} P_j + 1 \le r \le \sum_{j=1}^{n} P_j, \\
&A_{r,c} = \begin{cases} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{cases} \\
&0 \le c \le C \\
&C \le P_1 * P_2
\end{aligned}$$

153. A computer program according to Claim 146, wherein M=3, the number of rows $= P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

154. A computer program according to Claim 153, wherein a code rate = $(P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2)$.

155. A computer program embodied in a medium for encoding data transmitted to a communication channel, comprising the steps of:

(a) generating a parity check matrix comprising:

M tiers, wherein $M \geq 2$,

$D_{min} = 2 * M$ for $M=1..3$ or $2*M \geq D_{min} \geq 6$ for $M > 3$, wherein Dmin is the minimum Hamming distance,

$tc=M$, wherein tc is the column weight, and

cycle-4=0;

(b) linear block encoding the data in accordance with the matrix generated in step (a); and

(c) transmitting the data encoded in step (b) to the communication channel.

156. A computer program according to Claim 155, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

157. A computer program according to Claim 156, wherein the rank of said identity matrix of one of said tiers is mutually prime with respect to the rank of said identity matrix of another one of said tiers.

158. A computer program according to Claim 156, wherein said M tiers are arranged in increasing rank order.

159. A computer program according to Claim 158, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

160. A computer program according to Claim 156, wherein said matrix comprises R rows, wherein $R=\sum_{i=1}^{M} P_i$.

161. A computer program according to Claim 160, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

162. A computer program according to Claim 156, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

163. A computer program according to Claim 156, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

164. A computer program according to Claim 158, wherein for each element

$$[A_{r,c}]$$

$$\begin{aligned}
&For \sum_{j=1}^{n-1} P_j + 1 \leq r \leq \sum_{j=1}^{n} P_j, \\
&A_{r,c} = \begin{cases} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{cases} \\
&0 \leq c \leq C \\
&C \leq P_1 * P_2
\end{aligned}$$

165. A computer program according to Claim 158, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

166. A computer program according to Claim 165, wherein a code rate = $(P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2)$.

167. A method for generating a method for one of a low-density parity-check encoder and a low-density parity-check decoder, comprising the steps of:

providing M tiers of element, wherein M≥2,

selecting Dmin = 2 * M for M=1..3 or 2*M ≥ Dmin ≥ 6 for M > 3, wherein Dmin is the minimum Hamming distance,

selecting tc=M, wherein tc is the column weight, and

selecting cycle-4=0.

168. A method according to Claim 167, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \leq i \leq M$.

169. A method according to Claim 168, further comprising the step of setting the rank of said identity matrix of one of said tiers to be mutually prime with respect to the rank of said identity matrix of another one of said tiers.

170. A method according to Claim 168, further comprising the step of arranging said M tiers in increasing rank order.

171. A method according to Claim 170, wherein said matrix comprises C columns, wherein $C \leq P_1 * P_2$.

172. A method according to Claim 168, wherein said matrix comprises R rows, wherein $R=\sum_{i=1}^{M} P_i$.

173. A method according to Claim 172, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

174. A method according to Claim 168, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

175. A method according to Claim 168, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

176. A method according to Claim 170, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \le r \le \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{Bmatrix} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{Bmatrix}$$

$$0 \le c \le C$$

$$C \le P_1 * P_2$$

177. A method according to Claim 170, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

178. A method according to Claim 177, wherein a code rate = $(P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2)$.

179. A computer program embodied in a medium for generating a computer program for one of a low-density parity-check encoder and a low-density parity-check decoder, comprising the steps of:

providing M tiers of element, wherein M≥2,

selecting Dmin = 2 * M for M=1..3 or 2*M ≥ Dmin ≥ 6 for M > 3, wherein Dmin is the minimum Hamming distance,

selecting tc=M, wherein tc is the column weight, and

selecting cycle-4=0.

180. A computer program according to Claim 179, wherein each of said M tiers comprises an identity matrix having a corresponding rank P_i, wherein $1 \le i \le M$.

181. A computer program according to Claim 180, further comprising the step of setting the rank of said identity matrix of one of said tiers to be mutually prime with respect to the rank of said identity matrix of another one of said tiers.

182. A computer program according to Claim 180, further comprising the step of arranging said M tiers in increasing rank order.

183. A computer program according to Claim 182, wherein said matrix comprises C columns, wherein $C \le P_1 * P_2$.

184. A computer program according to Claim 180, wherein said matrix comprises R rows, wherein $R = \sum_{i=1}^{M} P_i$.

185. A computer program according to Claim 184, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ independent rows.

186. A computer program according to Claim 180, wherein said matrix comprises $\sum_{i=1}^{M} P_i - (M-1)$ parity bits.

187. A computer program according to Claim 180, wherein said matrix comprises $P_1 \times P_2 - \sum_{i=1}^{M} P_i + (M-1)$ maximum user bits.

188. A computer program according to Claim 182, wherein for each element

$$[A_{r,c}]$$

$$For \sum_{j=1}^{n-1} P_j + 1 \le r \le \sum_{j=1}^{n} P_j,$$

$$A_{r,c} = \begin{Bmatrix} 1, if c \bmod(P_n) = r - \sum_{j=1}^{n-1} P_j \\ 0, otherwise \end{Bmatrix}$$

$$0 \le c \le C$$

$$C \le P_1 * P_2$$

189. A computer program according to Claim 182, wherein M=3, the number of rows = $P_1+P_2+P_3$, the number of columns = P1 * P2, dmin=6, and tc=3.

190. A computer program according to Claim 189, wherein a code rate = (P_1 P_2+P_1-P_2-P_3+2)/(P_1 P_2).